TERMS AND DEFINITIONS

LT 7.04

ENABLING OBJECTIVES

- DEFINE the following terms as the apply to GFE:
  - Aerosol, Gases, Fumes, Dusts, Mist, Vapors, Flashpoint, Ignition Point, Auto-Ignition Point, **Explosive Range, LEL**, **UEL,** Toxicant, Toxicity, Toxic Substance
  - Hazardous Substance or Atmosphere, **TLV, PEL, IDLH**, Atmosphere, Atmospheric Contaminant, Ambient, Contaminant, Diffusion, **Confined Space,** Enclosed Space, Boundary Space, Closed Space, Boundary, **Hot Work, Cold Work, Inerting**

ENABLING OBJECTIVES

- **Pressing Up**, Steam Blanketing, **Initial Testing, Initial Certification, Periodic Testing, Continuous Testing, Retest/Recertify, Update**, Explosion Proof, Intrinsically Safe, Approved, Outgas, Personnel **Protective Equipment (PPE), TWA, STEL, C**

- EXPLAIN the purpose and function of the following organizations with regards to GFE:
  - **OSHA**
  - **NIOSH**
  - **ACGIH**
  - **NFPA**
  - **MSHA**

WHY ARE TERMS AND DEFINITIONS IMPORTANT?

- You, the GFE, must be able to use and understand terms
- Prevents misunderstandings between you, military personnel, and civilian personnel (think liability!)
- Lends credibility to your qualifications and your program

WHY ARE TERMS AND DEFINITIONS IMPORTANT?

WHY ARE TERMS AND DEFINITIONS IMPORTANT?

- LEGALITY
- STANDARDIZATION

PARTICULATE MATTER

- **AEROSOLS**
  - A GASEOUS SUSPENSION OF FINE PARTICLES

- **DUST**
  - SOLID, DRY, MECHANICALLY PRODUCED PARTICLES OF MATTER
  - RESULT FROM:
    - SANDING
    - GRINDING
    - SAWING

PARTICULATE MATTER

- **FUMES**
  - SOLID PARTICLES FORMED BY CONDENSATION OF METALS FROM THE GASEOUS STATE
  - WELDING

PARTICULATE MATTER

- **GASES**
  - MATTER WHICH DIFFUSES & OCCUPIES SPACE EVENLY
  - NOT SOLID OR LIQUID AT STP
  - (32 DEG. F & 14.7 PSI)
- **VAPORS**
  - GASEOUS FORM OF A SUBSTANCE THAT IS NORMALLY A LIQUID OR SOLID

COMBUSTIBILITY POINTS

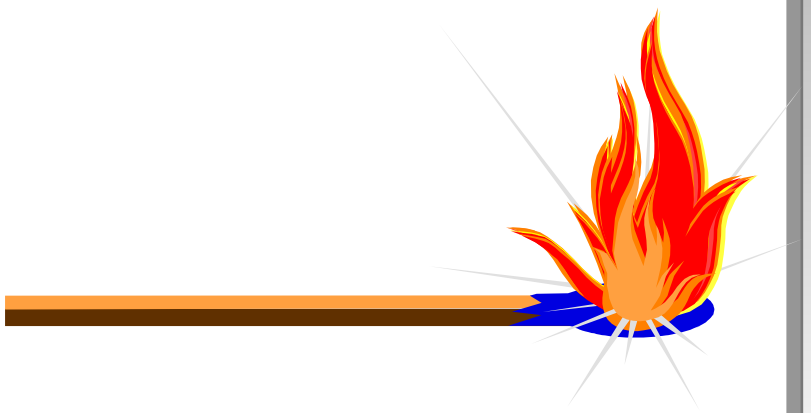
- **Expressed in increasing temperature order:**
  - ***FLASH POINT***
  - ***FIRE POINT***
  - ***AUTO-IGNITION POINT***

FLASH POINT

- LOWEST TEMPERATURE AT WHICH A LIQUID GIVES OFF ENOUGH VAPOR TO FORM A FLAMMABLE MIXTURE WITH THE AIR ABOVE THE LIQUID.
- **(WILL NOT SUSTAIN FLAME)**

FIRE POINT

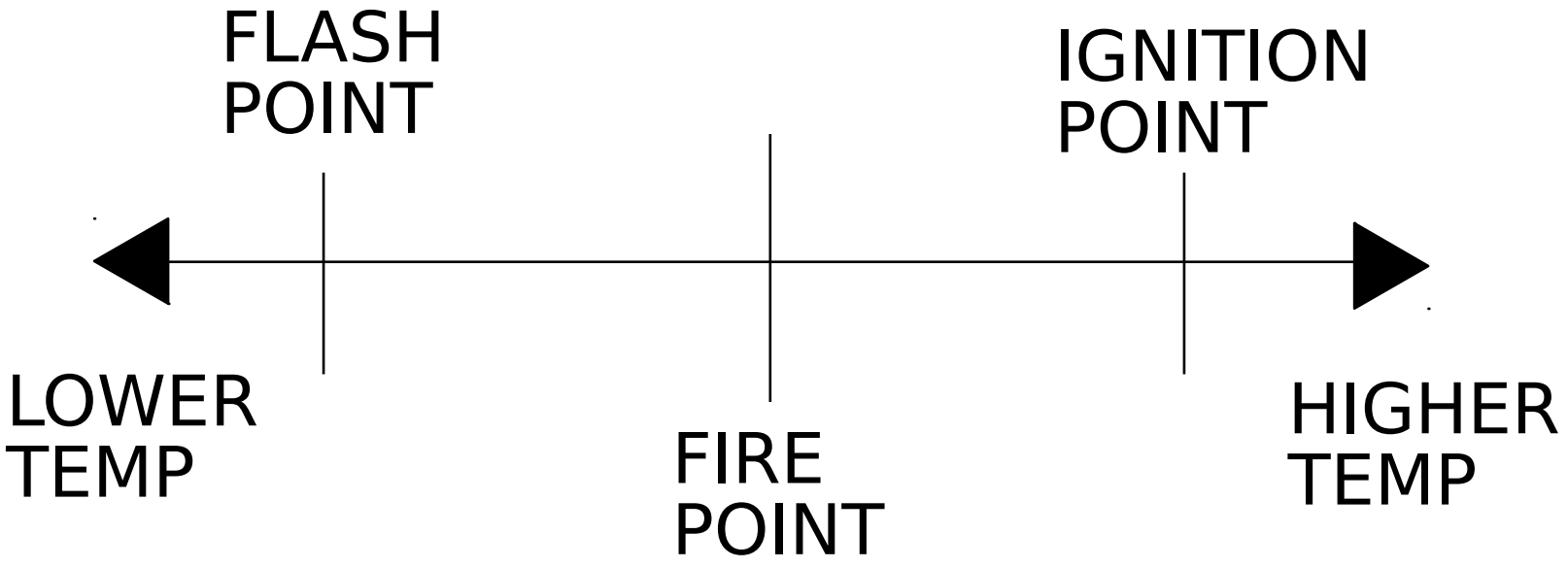
- THE TEMPERATURE AT WHICH SUFFICIENT VAPOR IS GIVEN OFF TO CONTINUE BURNING AFTER IGNITION.



AUTO-IGNITION POINT

- THE MINIMUM TEMPERATURE REQUIRED TO INITIATE SELF-SUSTAINED COMBUSTION OF A SUBSTANCE INDEPENDENT OF EXTERNAL IGNITION SOURCES.

PERSPECTIVE



PERSPECTIVE

FLASH POINT

IGNITION POINT

LOWER TEMP

FIRE POINT

HIGHER TEMP

PERSPECTIVE

FLASH POINT

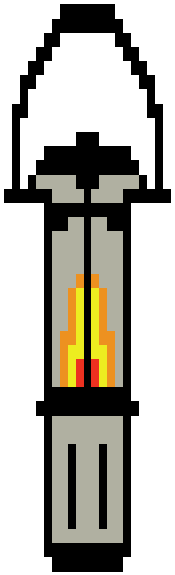
IGNITION POINT

LOWER TEMP

FIRE POINT

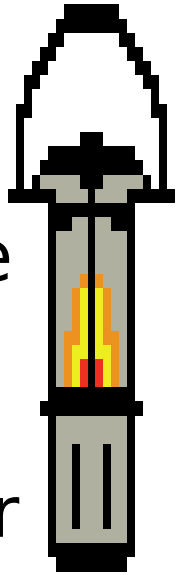
HIGHER TEMP

EXPLOSIVE RANGE

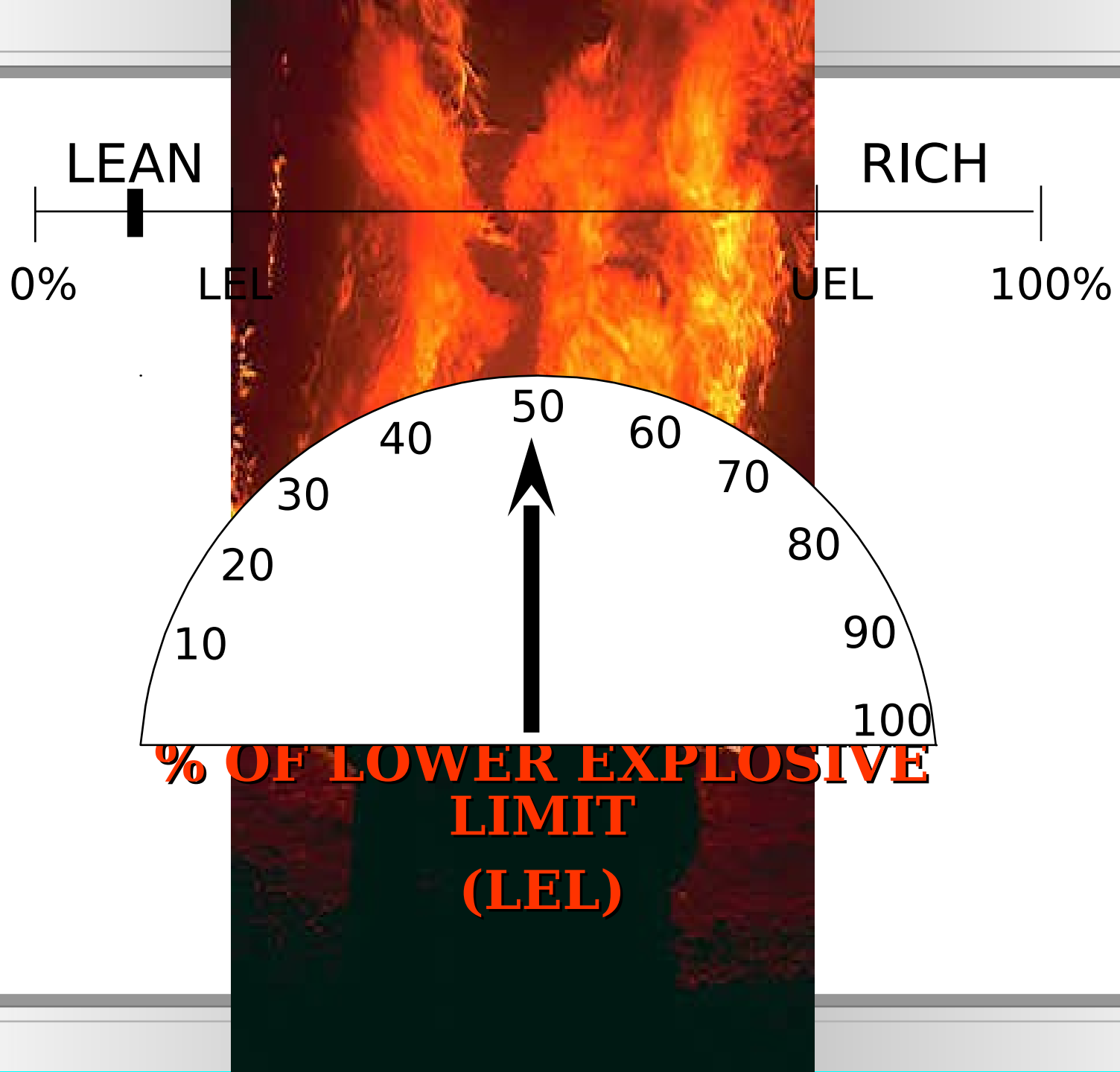


- Scale that indicates the explosive nature of gases or vapors
- Relationship of the concentration of the vapor present, its temperature & pressure
- Expressed as percent by volume in air

EXPLOSIVE RANGE



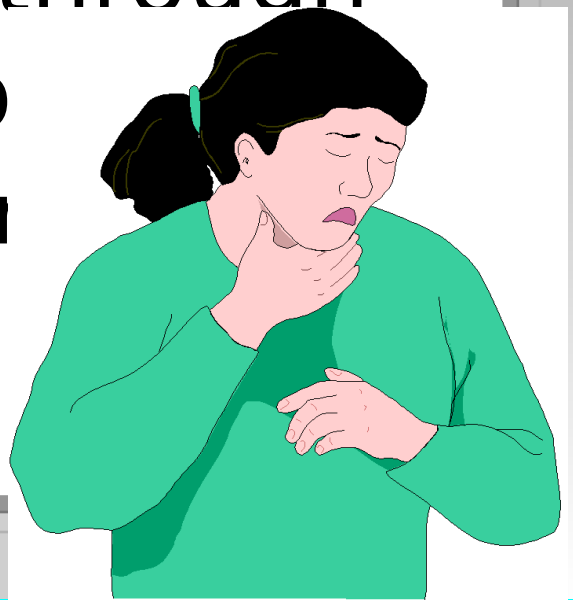
- If Explosive Range falls <u>below</u> the Lower Explosive Limit (LEL), the mixture of air and vapor is too *lean* for an explosion
- If Explosive Range is <u>above</u> the maximum explosive range or Upper Explosive Limit (UEL), the mixture of vapor and air is too *rich* to be explosive


LEAN
RICH
0%
LEL
UEL
100%
10
20
30
40
50
60
70
80
90
100
% OF LOWER EXPLOSIVE LIMIT (LEL)

TOXIC RELATED
TERMS

TOXIC MATERIAL

- A solid, liquid, or gas that can damage living material, impair the central nervous system, or cause illness or death through inhalation, ingestion, o absorption. (poiso



HAZARDOUS SUBSTANCE/ATMOSPHERE

- Any substance or atmosphere likely to cause injury or death by being:
  - Explosive - Flammable
  - Toxic (poisonous)
  - Oxidizing - Irritating
  - Corrosive

TOXIC RELATED TERMS

- **AMBIENT**
- Surrounding or encircling area

- **ATMOSPHERE**
  - Immediate gaseous surroundings of a location or confined space
  - Includes normal air plus any air contaminants and oxygen deficiency/excess

ATMOSPHERIC CONTAMINANT

- Substance or material that is foreign to the normal composition of the atmosphere
- Occurs in the form of:
  - Aerosols - Dust
  - Fumes - Mist
  - Gases - Vapors

DIFFUSION

- Process of scattering or mixing of physical states (i.e.. temperature) or of gases (when one gas is introduced to another)

CONFINED SPACE

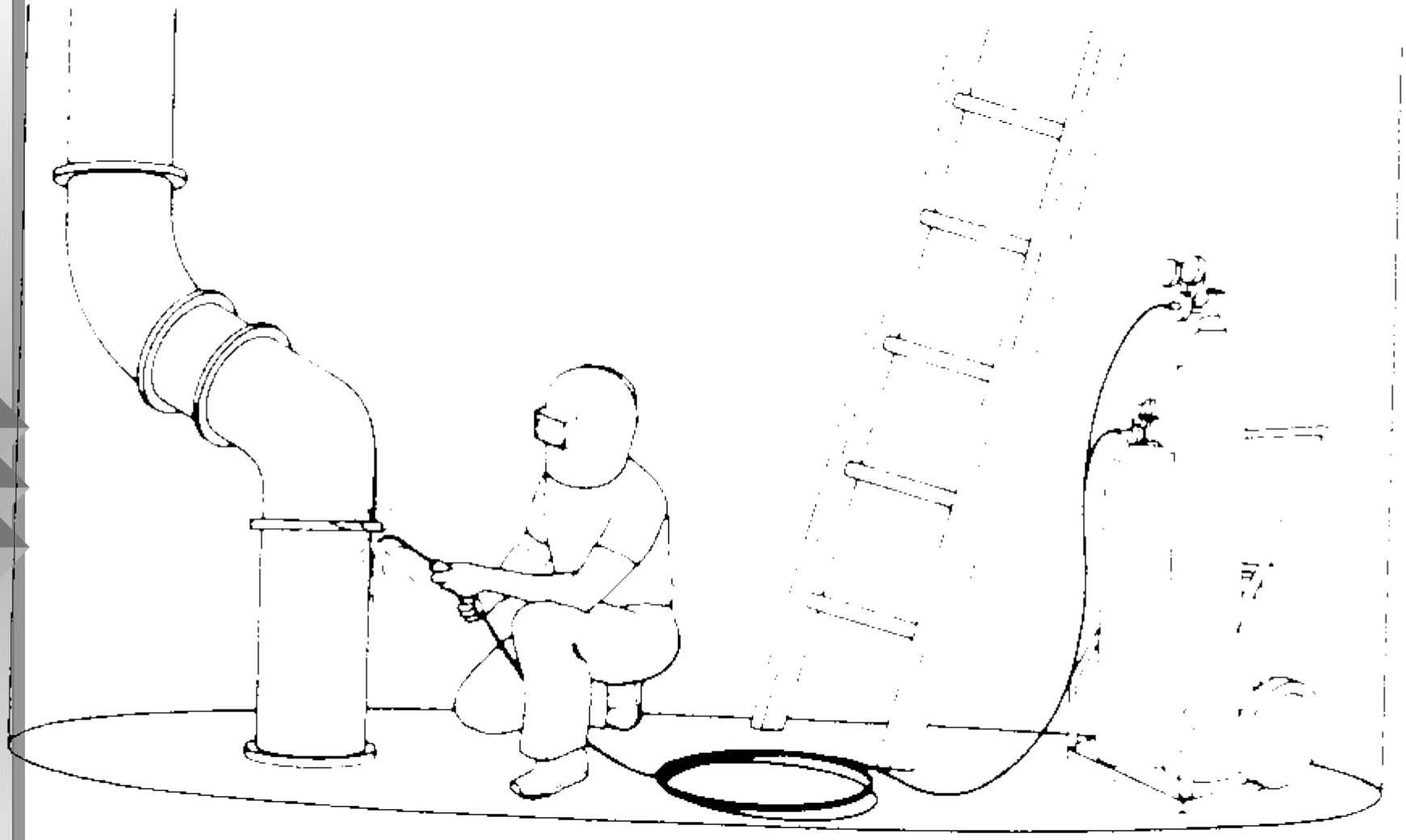
- Limited and restricted accesses
- Lack of natural ventilation
- May contain or produce hazardous contaminants or oxygen deficiencies or enrichment
- Not intended for continuous occupancy

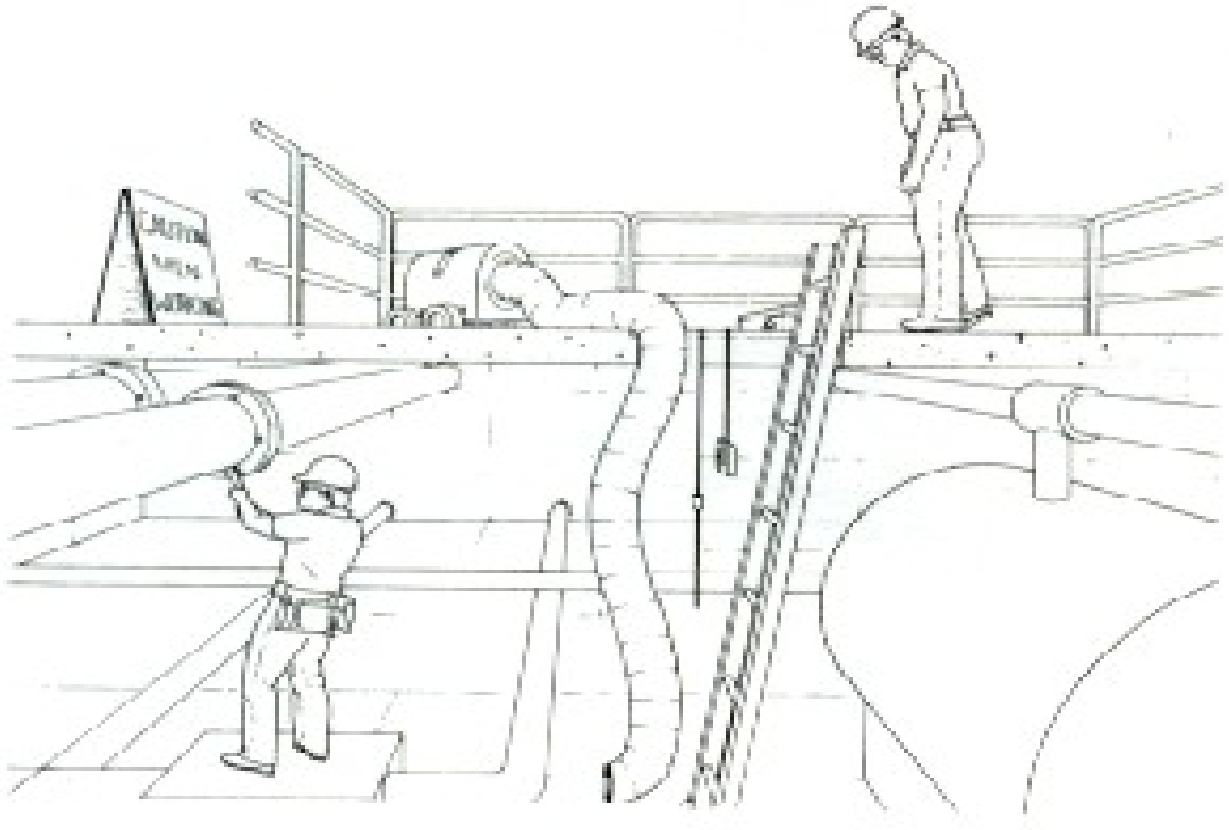
CONFINED SPACE CHARACTERISTICS

- Large enough for worker to enter
- Contains or can contain hazardous atmosphere produced by sludge, chemicals, sewage
- Laid out so anyone who enters may be trapped or asphyxiated

CONFINED SPACES

- Tanks
- Voids
- Interior machinery (boilers, condensers, oil sumps)
- Non-ventilated storerooms
- Ventilation & Exhaust ducts





DANGER
DO NOT ENTER
GAS FREE
PERMIT REQUIRED
CONFINED SPACE

BOUNDARY SPACE

- The outermost border or limit immediately surrounding a confined space above, below, and on all sides
- Outside walls of a fuel tank

CLOSED COMPARTMENT

- Any space not well ventilated
  - Storerooms
  - Double bottoms
- Spaces may be normally occupied but have been
  - Vacated
  - Closed
  - Sealed

HOT WORK

- Any operation which produces a flame, spark, or temperatures in excess of 400 deg F.
  - GRINDING
  - WELDING
  - CUTTING
  - DRILLING
  - PAINT CHIPPING

COLD WORK

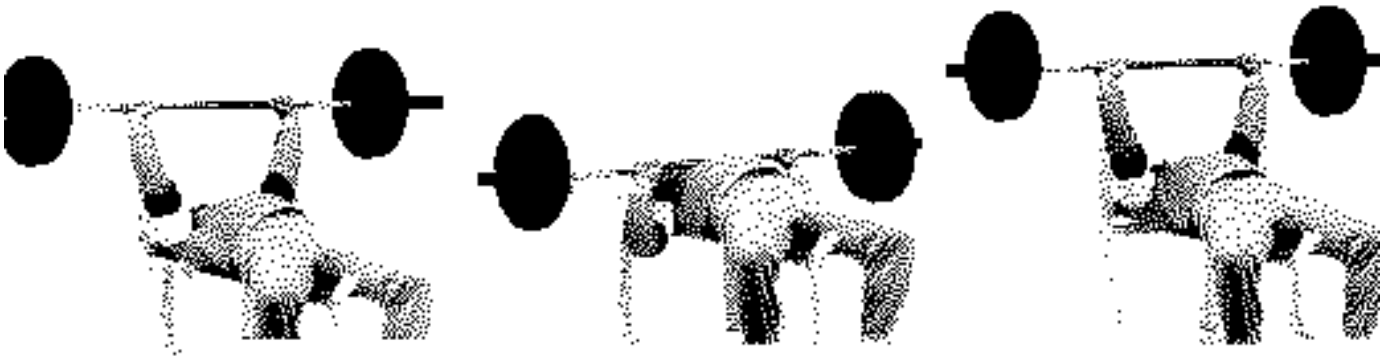
- Operations involve only Inspections, Cleaning or Minor Repair where no Hot work is conducted
- Space Inspections
- Spray Painting
- Chemical Cleaning
- Use of thinners, strippers, or vapor-producing cleane

INERTING

- Process in which an inert or non-flammable gas is introduced into an atmosphere
  - *Carbon Dioxide*
  - *Helium*
  - *Argon*
  - *Nitrogen*
- Prevents flammable vapor/air mixtures from exploding

PRESSING UP

- Process of completely filling a space with water to displace flammable vapor/air mixtures



INITIAL TESTING

- Testing conducted on confined space when space is first opened after a period of closure
  - Tests conducted on fuel tank when tank has been in service and will be taken out of service for repair

INITIAL CERTIFICATION

- The certificate issued by Gas Free Engineering personnel as a result of initial testing

TESTING REQUIREMENTS

- **PERIODIC TESTING**
  - Testing conducted during the course of operation
  - Based on nature of the space, its contents, & the nature of operation
  - Conducted at intervals greater than 15 minutes
- **CONTINUOUS TESTING**
  - Used to determine the presence of flammables, toxicants, or oxygen
  - Conducted throughout the course of operation
  - Not more than 15 minutes between tests

UPDATING CERTIFICATES

- Process of conducting tests, inspections, or evaluations of conditions within a confined space
- Certifying that conditions have not changed
- Conditions are acceptable as initially specified

TOXIC EXPOSURE LIMITS

- Permissible Exposure Limits (PEL)
- Threshold Limit Values (TLV)

PERMISSIBLE EXPOSURE LIMIT (PEL)

- The maximum permissible concentration of a toxic agent to which personnel may be exposed.
- Published by OSHA - ***Force of law***
- Based on a TWA for a normal 8-hour day, 40 hour, 7-day week
- Expressed in parts per million (ppm)
- Single toxicants only
- ***Listed in Appendix G of NSTM 074 Vol 3***

THRESHOLD LIMIT VALUES (TLV)

- Levels of airborne concentrations of physical agents which average personnel may be repeatedly exposed during normal working hours without adverse effects
- Published by ACGIH, expressed in PPMs
- Subdivisions:
  - TWA
  - STEL
  - Ceiling Limits (C)

EXPOSURE SUB-DIVISIONS

- Time Weighted Average (TWA)
  - Most commonly used
  - Calculated in 8 hour days, 40 hour, 7-day week
- Short Term Exposure Limit (STEL)
  - 4 excursions, less than 15 minutes each, 60 minutes apart
- Ceiling Limit (C)
  - Concentration of substance above which personnel should not be exposed, even instantaneously

WARNING:

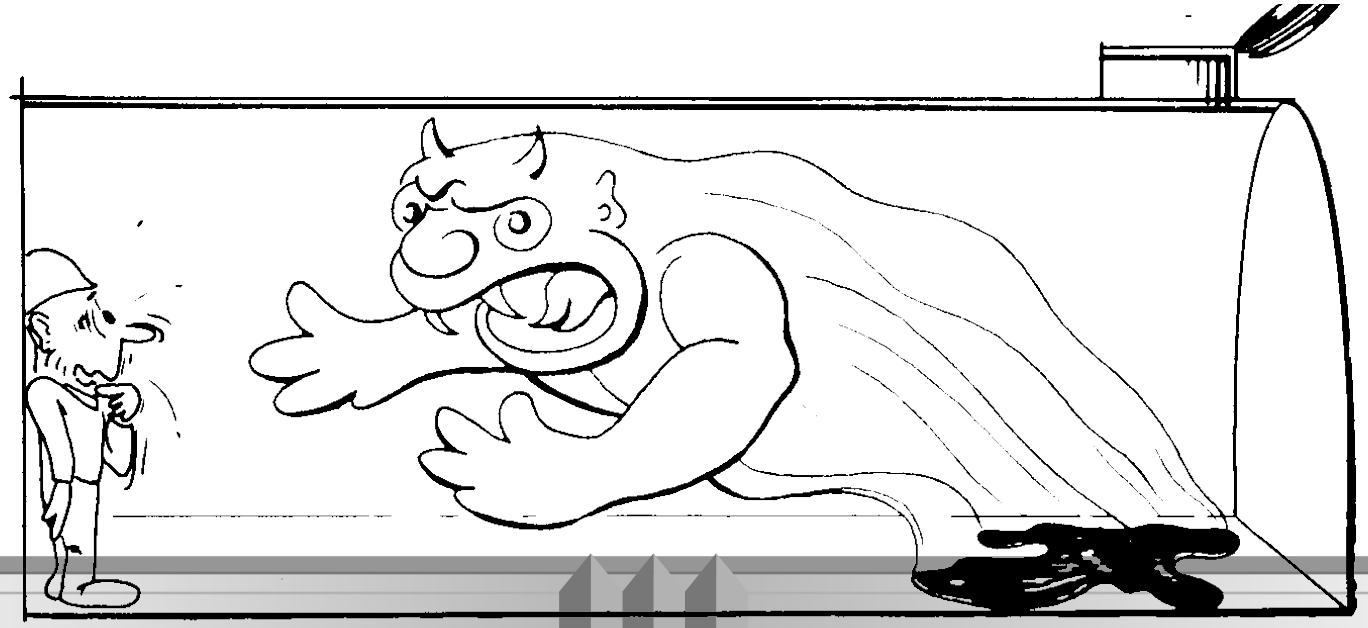
THE FOLLOWING INFORMATION COULD SAVE YOUR LIFE OR SOMEONE ELSE'S

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH (IDLH)

- Any atmosphere that meets one or more of the following conditions
- Oxygen content < 19.5 or > 22%
- Flammable vapors at a concentration of 10% or > LEL
- Presence of toxicants above IDLH limits (Appendix G of 074 Vol. 3)

SPACES ASSUMED TO BE IDLH

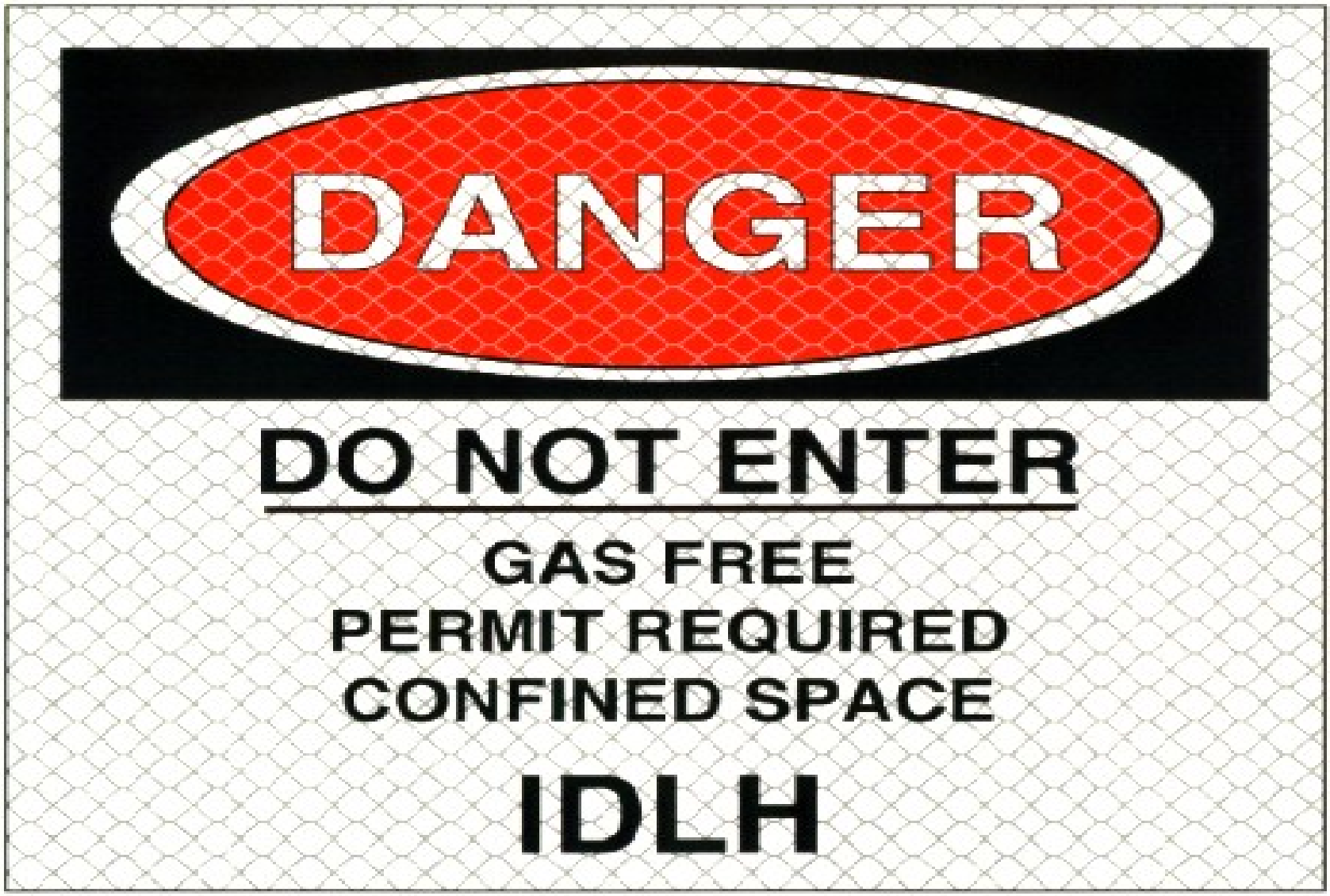
- SEWAGE TANKS
- FUEL TANKS
- CHEMICAL HOLDING TANKS



DON'T TAKE CHANCES! TEST THE ATMOSPHERE

IDLH SPACES

- CO's permission to enter
- Notify CO immediately upon *discovering* an IDLH condition


DANGER
DO NOT ENTER
GAS FREE
PERMIT REQUIRED
CONFINED SPACE
IDLH

WHEN CAN I GAS FREE AN IDLH SPACE?

- EMERGENCY/OPERATIONAL NECESSITY
- CO'S PERMISSION

IDLH RESTRICTIONS

- EMERGENCY/OPERATIONAL NECESSITY
- CO’S PERMISSION

GAS FREE ENGINEERING RELATED ORGANIZATIONS

OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION (OSHA)

- US DEPT OF LABOR
- REGULATORY AGENCY WITH ENFORCEMENT AUTHORITY
- WRITES TITLE 29, CFR
- SETS PEL's FOR TOXIC SUBSTANCES

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY & HEALTH (NIOSH)

- US Dept of Health & Human Services
- US Public Health Services
- Centers for Disease Control (CDC)
- Non-regulatory agency
- No enforcement authority

- Tests & approves equipment
- Similar to Underwriter's Lab (U/L)
- ***Recommends toxic exposure limits to OSHA***
- ***Defines IDLH atmospheres***

MINE SAFETY & HEALTH ADMINISTRATION (MSHA)

- US DEPARTMENT OF LABOR
- PERFORMS SIMILAR FUNCTION TO NIOSH
  - RESPIRATORS, PERSONAL PROTECTIVE CLOTHING

AMERICAN CONFERENCE OF GOVERNMENT INDUSTRIAL HYGIENISTS (ACGIH)

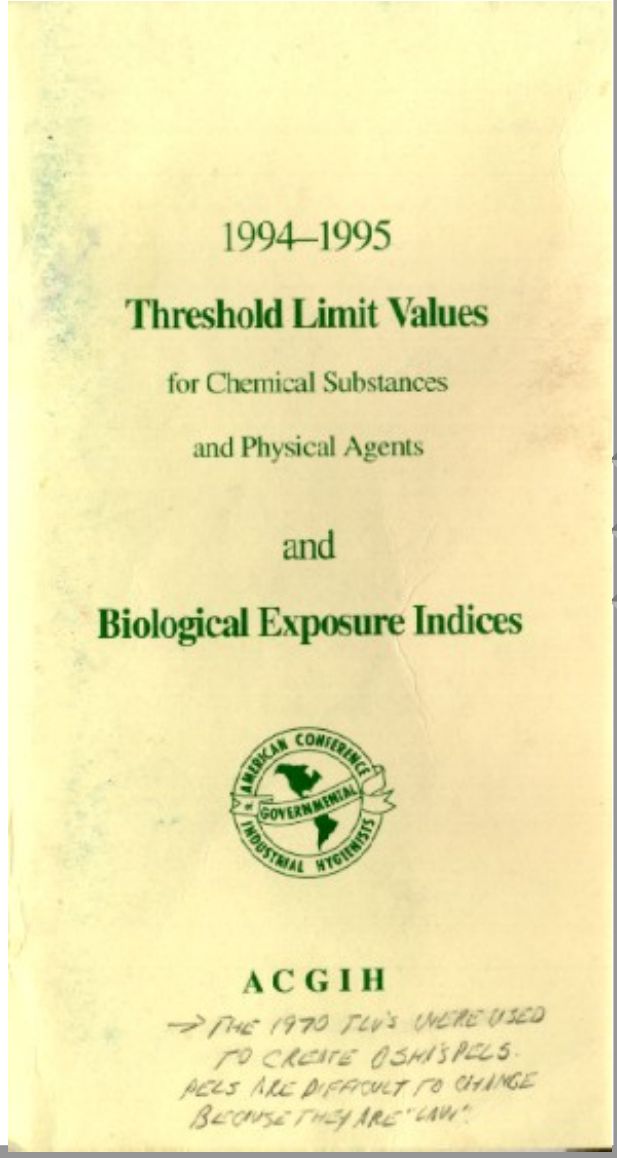
- PROFESSIONAL SOCIETY
  - NOT GOVERNMENT AGENCY
- PUBLISHES INDUSTRIAL VENTILATION STANDARDS
- NON-REGULATORY, NO ENFORCEMENT AUTHORITY

ACGIH® WORLDWIDE

Celebrating 60 years of outstanding service to occupational and environmental health and safety!

ACGIH

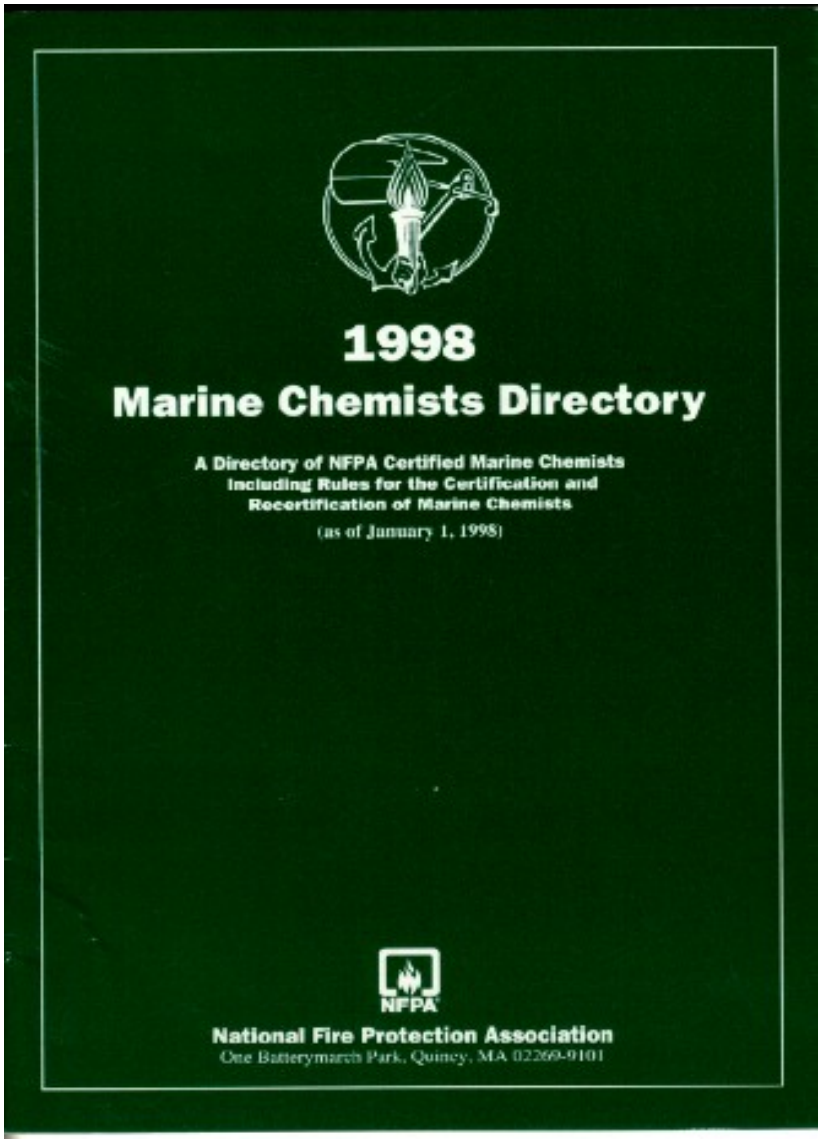
- ***PUBLISHES TLV's***
  - **FREQUENTLY ADOPTED BY OSHA AS PEL's**


1994–1995
Threshold Limit Values
for Chemical Substances
and Physical Agents
and
Biological Exposure Indices
AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS
ACGIH
→ THE 1970 TLV's WERE USED TO CREATE OSHA'S PELS. PELS ARE DIFFICULT TO CHANGE BECAUSE THEY ARE "LAW".

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- Professional organizatio
- ✔ ***Certify Marine Chemi***
- Publish a wide variety of fire safety related standards

SPARKY
The name and image of Sparky®, and the phrase, Learn Not to Burn®, are registered trademarks of the National Fire Protection Association, Quincy, MA.


1998
Marine Chemists Directory
A Directory of NFPA Certified Marine Chemists
Including Rules for the Certification and
Recertification of Marine Chemists
(as of January 1, 1998)
NFPA
National Fire Protection Association
One Batterymarch Park, Quincy, MA 02269-9101

ANY QUESTIONS?

- **QUESTION #1:**
- Why is a complete understanding of GFE terms and definitions necessary?
- Legality
- Standardization

QUESTION #2

- WHAT IS HOT WORK?
- Operations involving open flame, arms, sparks, slag or other ignition sources or that produce heat of 400 deg. F or more.

LAST QUESTION

- **When are you allowed to enter an IDLH space?**
- Emergency or operational necessity
- After receiving the CO's permission

WHAT DOES MY FUTURE HOLD AS A GFE?
THE END